

Benedetto Lanza*, Kurtuluş Olgun**, Elisabetta Gentile***,
Nazan Üzümlü** & Aziz Avcı**

Vertebral number in *Batrachuperus persicus*, genus *Neurergus* and Turkish *Triturus* (Amphibia: Caudata)

Abstract - New data, summarized in “Conclusions”, on the number of trunk and postsacral vertebrae in *Batrachuperus persicus*, *Neurergus crocatus*, *N. kaiseri*, *N. microspilotus*, *N. strauchii*, and in the Turkish *Triturus* (*T. karelinii*, *T. vittatus*, *T. vulgaris*).

Key words: vertebral number, Hynobiidae, *Batrachuperus persicus*, Salamandridae, *Neurergus*, *Triturus*, Iran, Georgia, Turkey.

Riassunto - Sul numero di vertebre in *Batrachuperus persicus*, nel genere *Neurergus* e nei *Triturus* turchi (Amphibia: Caudata).

Nuovi dati sul numero delle vertebre del tronco e postsacrali di *Batrachuperus persicus*, *Neurergus crocatus*, *N. kaiseri*, *N. microspilotus*, *N. strauchii*, e dei *Triturus* della Turchia (*T. karelinii*, *T. vittatus*, *T. vulgaris*). *Batrachuperus persicus* ha 16 o, usualmente, 17 vertebre del tronco e 41-44 postsacrali. Nel genere *Neurergus* le prime sono per lo più 13, talora 14, le seconde 32-39. Il numero delle vertebre del tronco delle tre sottospecie del *Triturus vittatus* corrisponde fondamentalmente a quello già noto; quelle del tronco e quelle postsacrali sono rispettivamente 12 e 29-40 in *T. v. vittatus*, per lo più 12 (talora 13) e 30-40 in *T. v. cilicensis*. Quanto al *T. vittatus ophryticus*, si conferma che in questa sottospecie, come già messo in evidenza da Arntzen & Olgun (2000), i valori modali delle vertebre del tronco crescono clinalmente da W (moda 12) a E (moda 13); secondo le nostre ricerche, nelle popolazioni che vivono fra le latitudini 29°04'E-31°49'E e 36°34'E-39°13'E (e in Georgia) il numero delle vertebre del tronco varia rispettivamente da 11 a 13, con moda 12, in quelle occidentali, da 12 a 14, con moda 13, in quelle orientali; la differenza del numero di vertebre del tronco tra le popolazioni del gruppo occidentale e quelle del gruppo orientale sono statisticamente altamente significative [G-test (Williams correction) $P < 0,001$]; nelle popolazioni orientali (mancano i dati di quelle occidentali) le vertebre postsacrali sono 34-46. In *Triturus v. vulgaris*, *T. v. kosswigi*, *T. v. schmidlerorum* (quasi sicuramente sinonimo di *T. v. vulgaris*) e nella “sottospecie” di Efeso il numero delle vertebre del tronco varia da 11 (valore trovato in un solo esemplare di *T. v. kosswigi*) a 13, con moda e media di circa 12. Non esistono differenze statisticamente significative tra ♂♂ e ♀♀ quanto al numero delle vertebre del tronco. In tutti i taxa studiati, *Neurergus s. strauchii* e *N. s. barani* esclusi, i ♂♂ hanno in media più vertebre postsacrali delle ♀♀, ma, stante la scarsa rappresentatività di una parte del nostro materiale, abbiamo trovato una differenza statisticamente significativa solo fra i due sessi di *Triturus vittatus cilicensis*, *T. vittatus ophryticus* e *T. vulgaris kosswigi*.

Key words: numero vertebrale, Hynobiidae, *Batrachuperus persicus*, Salamandridae, *Neurergus*, *Triturus*, Iran, Georgia, Turchia.

*Museo di Storia Naturale (Sezione Zoologica “La Specola”) & Dipartimento di Biologia Animale e Genetica dell’Università, Via Romana 17, 50125 Firenze, Italy, e-mail: benedetto.lanza@tin.it

**Adnan Menderes Üniversitesi, Fen-Edebiyat Fakültesi, Biyoloji Bölümü, 09010 Aydin, Turkey, <http://biyoloji.adu.edu.tr>

***Centro per lo Studio e la Prevenzione Oncologica (Istituto Scientifico della Regione Toscana), Viale Alessandro Volta 171, 50131 Firenze, Italy, e-mail: e.gentile@cspso.it

Introduction

As part of research on the vertebral number in the Caudata of the western Palaearctic (Lanza *et al.*, in progress), we had the occasion to examine some south-western Asian specimens of *Batrachuperus*, *Neuregus* and *Triturus*. The results of our research are the subject of the present paper.

Methods

Our counts concern trunk and postsacral (i.e sacro-caudal + caudal) vertebrae, from which (anomalies excluded) we can obtain the total vertebral number adding 2 (atlas and sacrum). The count of the trunk vertebrae, made on X-ray photographs, refers to the centra and not the rib pairs, whose number, apart from the possible anomalies, not always corresponds to that of the trunk vertebrae; e.g., the last trunk vertebra may have very small ribs (not always easy to be detected) or no ribs at all.

All the data from the literature have been adjusted to include only the trunk vertebrae.

Material and results

In the list of the material each collection number is followed by two numbers. The first one, rarely missing, refers to the number of trunk vertebrae, i.e. number of pre-sacral vertebrae, atlas excluded. The second one, sometimes missing and usually to be regarded as approximate, refers to the number of postsacral vertebrae, i.e. number of sacro-caudal + caudal vertebrae, including the smallest radiographically detectable apical elements. We decided to add these individual data as they may eventually turn out to be useful for further research, e.g. on the possible occurrence of clines, as well as to obviate information loss due to any taxonomic change. Unless otherwise stated, the specimens studied are adults. Some data on the trunk vertebrae of unsexed specimens of *Triturus karelinii* and *T. vittatus ophryticus*, already included in Lanza *et al.* (in progress), were sent us by J. W. Arntzen, while data on the vertebral number of *Batrachuperus persicus* were provided by D. B. Wake.

The following abbreviations and collection acronyms have been used: BMNH= The Natural History Museum, London; cl= confidence limits; KOC= Kurtuluş Olgun Collection (Adnan Menderes University, Biology Department, Aydın, Turkey); don.= donavit or donaverunt; juv.= juvenile(s); leg.= legit or legerunt; m= arithmetic mean; MNÇN= Museo Nacional de Ciencias Naturales (Madrid; Spain); MVZ= Museum of Vertebrate Zoology, University of California at Berkeley (Berkeley; USA); MZUF= Museo di Storia Naturale (Sezione Zoologica “La Specola”), Università degli Studi (Florence; Italy); n= number of specimens studied; NHCL= New Herpetological Collection Lanza (Florence; Italy; donated to the MZUF); NMW= Naturhistorisches Museum Wien (Vienna; Austria); pov.= number of postsacral vertebrae; reg.= regenerated tail; RMNH= Rijksmuseum van Natuurlijke Historie (Leiden; Holland); s= standard deviation; spec.= specimen(s) studied; trv.= number of trunk vertebrae; uns.= unsexed; ZDEU= Zoological Department of the Ege University, Izmir (Turkey); ZMA= Zoölogisch Museum (Instituut voor Taxonomische Zoölogie, Universiteit van Amsterdam; Netherlands).

Family Hynobiidae Cope, 1860

Genus *Batrachuperus* Boulenger, 1878

Batrachuperus persicus Eiselt et Steiner, 1970 (4 spec.: 1 larva, 1 juv. ♂, 1 ♂, 1 juv. ♀).

Iran. Prov. Gilan. Near Asalem (= Assalem, Navrud; 37°42'N-48°57'E), ca. 800 m a.s.l. Leg. H. M. Steiner; 25.VII.1968; 1 spec. : larva NMW 19435/3 (17-?).

Iran. Prov Mazanderan. Shirabad Cave, 5 km SE of Shirabad and 60 km E of Gorgān (Gorgān= 36°50'N-54°29'E), 310 m a.s.l. Leg. Theodore J. Papenfus; 13.X.1998. 3 spec.: 1 juv. ♂ MVZ 233501 (17-41), 1 ♂ MVZ 241494 (17-44), 1 juv. ♀ MVZ 238502 (16-?).

Data from the literature: seemingly no data.

Our data:

trv.	spec.	range	m ± s	cl 5%
♂♂	2	17	17	17
♀♀	1	16	-	-
uns.	1 (larva)	17	-	-
♂♂+♀♀+uns.	4	16-17	16.8 ± 0.5	15.95-17.55
pov.	spec.	range	m ± s	cl 5%
♂♂	2	41-44	42.5	-

Family Salamandridae Goldfuss, 1820

Genus *Neurergus* Cope, 1862

Neurergus crocatus Cope, 1862 (4 spec.: 1 ♂, 3 ♀♀).

Iran. Prov. Kordestān. Surkev Dagħ. Presented by St. Petersburg University; syntype of *Rhithrotriton derjugini derjugini* Nesterov, 1916. 1 spec.: ♂ BMNH 1946.9.5.91 (13-?).

Iraq. Unspecified locality (specimens kept and bred in captivity; 1998). 3 spec.: 3 ♀♀ RMNH 39419 (13-34), 39420 (13-37), 39421 (13-35).

Data from the literature: seemingly no data.

Our data:

trv.	spec.	range	m ± s	cl 5%
♂♂	1	13	-	-
♀♀	3	13	13	13
pov.	spec.	range	m ± s	cl 5%
♀♀	3	34-37	35.3 ± 2.333	31.54-39.13

Neurergus kaiseri Schmidt, 1952 (1 spec.: 1 ♂).

Iran. Prov. Chahrmahal-va-Bakhtiyari (Lorestan). Shahbazan (= Shah Bazan), 32°47'N-48°39'E, 540-600 m. Leg. G. Schultschik; 29.III.1995. 1 spec.: ♂ 34145 (13-?) NMW.

Data from the literature: seemingly no data.

Our data:

trv.	spec.	range	m ± s	cl 5%
♂ ♂	1	13	-	-

Neurergus microspilotus (Nesterov, 1916) (6 spec.: 6 ♂ ♂).

Iran. Prov. Kordestān. Paweh (35°03'N-46°22'E). Leg. et don. Dr. Habibi (Teheran University). 1 spec.: ♂ 1968.852 (13-37) BMNH

Iran. Prov. Kordestān. Paweh (35°03'N-46°22'E). Quriqaleh (= Quri-Qaleh), 25 km SE of Paweh. Leg. G. Schultschik; 6.IV.1995. 5 spec.: 5 ♂ ♂ 34144/1 (13-36); 34144/2 (13-39); 34144/3 (13-32); 34144/4 (13-38); 34144/5 (13-37) NMW.

Data from the literature: seemingly no data.

Our data:

trv.	spec.	range	m ± s	cl 5%
♂ ♂	6	13	13	13
pov.	spec.	range	m ± s	cl 5%
♂ ♂	6	32-39	36.5±2.429	33.95-39.05

Neurergus strauchii (Steindachner, 1888) (12 spec.: 3 larvae, 2 ♂ ♂, 5 ♀ ♀, 2 uns.).

Neurergus strauchii barani Öz, 1994 (3 spec.: 1 ♂, 2 ♀ ♀).

Turkey. Mt Kubbe (38°17'N-38°31'E). Malatya, 1966 m. Leg. İ. H. Uğurtaş; IV. 2002; 3 spec.: 1 unnumbered ♂ KOC (13-37), 2 ♀ ♀: ♀ 26225 (13-39) MZUF (ex 5142 NHCL, in exchange from KOC), unnumbered ♀ (13-38) KOC.

Data from the literature: seemingly no data.

Our data:

trv.	spec.	range	m ± s	cl 5%
♂ ♂	1	13	-	-
♀ ♀	2	13	13	13
pov.	spec.	range	m ± s	cl 5%
♂ ♂	1	37	-	-
♀ ♀	2	38-39	38.5	-
♂ ♂+♀ ♀	3	37-39	38 ± 1	35.52-40.48

Neurergus strauchii strauchii (Steindachner, 1888) (9 spec.: 3 larvae, 1 ♂, 3 ♀♀, 2 uns.).

Turkey. Lake Van. Bitlis, 38°22'N-42°06'E, close to the SW corner of the lake, ca. 900 m. Leg. İ. Baran; 3.V.1977. 2 spec.: 1 ♂ 25534 (13-34) MZUF (ex 4757 NHCL); 1 ♀ 25535 (13-39) MZUF (ex 4758 NHCL).

Turkey. Lake Van. Bitlis, 38°22'N-42°06'E. Specimens kept and bred in captivity; 1998. 2 spec.: 2 ♀♀ RMNH 39417 (13-?), 39418 (14-37).

Turkey. Lake Van. Bitlis, 38°22'N-42°06'E. 9 km S of Bitlis. Leg. J. Eiselt *et al.* (Anatolien Exp. 1968); 3 spec.: 3 larvae 19434/1 (13-?), 19434/2 (13-?), 19434/3 (13-?) NMW.

Turkey. Unspecified locality of SE Turkey. Leg.? Date? 2 spec.: 2 unnumbered uns. (13-?) (13-?) MNÇN (or ZMA?).

Data from the literature: seemingly no data.

Our data:

trv.	spec.	range	m ± s	cl 5%
♂♂	1	13	-	-
♀♀	3	13-14	13.3 ± 0.577	11.9-14.77
uns.	5	13	13	13
♂♂+♀♀+uns.	9	13-14	13.1 ± 0.333	12.85-13-37
pov.	spec.	range	m ± s	cl 5%
♂♂	1	34	-	-
♀♀	2	37-39	38	-
♂♂+♀♀	3	34-39	36.7 ± 2.517	30.41-42.92

Genus *Triturus* Rafinesque, 1815

Triturus karelinii (Strauch, 1870) (80 spec.: 28 ♂♂, 26 ♀♀, 26 uns.).

Turkey. Unspecified locality. Leg. P. Elvin; 1985; 2 spec.: 1 ♂ MZUF 17588 (13-35); 1 ♀ MZUF 17589 (13-33) (Prof. Giorgio Mancino don., Pisa Univ.).

Turkey. Bartın, 41°38'N-32°21'E. Leg. J. W. Arntzen; 8.IV.1983; 13 spec.: 13 unnumbered uns. spec. (12 spec. with 13 trv., 1 with 14; ? pov.).

Turkey. NW European Turkey. İstanbul Prov. Büyükçekmece, 41°01'N-28°34'E, ca 120 m a.s.l. Leg. F. Huşengi; 13.IV.1978. 2 spec.: 1 ♂ MZUF 25540 (ex 4763 NHCL) (14-42); 1 ♀ 25541 MZUF (ex 4764 NHCL) (13-33); in exchange from the ZDEU, formerly Nos 92/1978-12 (♂) and 92/1978-2 ZDEU.

Turkey. Adazaparı, 40°46'N-30°24'E. Leg. J. W. Arntzen; date? 13 spec.: 13 unnumbered uns. spec. (12 spec. with 13 trv., 1 spec. with 14; ? pov.).

Turkey. Saddle above Abant Lake, near Bolu (Bolu= 40°44'N-31°37'E). Leg. Paget, Kritscher & Bilek; 21.IX.1969. 12 spec.: 8 ♂♂ NMW 19474/1 (13-37), 19474/3 (13-?), 19474/4 (13-41), 19474/5 (13-42), 19474/8 (13-35), 19474/9 (13-37), 19474/10 (13-39), 19474/11 (13-?); 4 ♀♀ NMW 19474/2 (14-40), 19474/6 (13-35), 19474/7 (13-34), 19474/12 (13-38).

Turkey. Sapanca Lake, 40°41'N-30°16'E. 3 km W of Sapanca Lake. Leg. J. Eiselt *et al.* (III. Anatolien Exp.); 1966. 10 spec.: 4 ♂♂ NMW 18524/1 (13-42), 18524/2 (13-42), 18524/3 (13-36), 18524/4 (13-38); 6 ♀♀ NMW 18524/5 (14-36), 18524/6 (13-?), 18524/7 (14-36), 18524/8 (13-37), 18524/9 (13-?), 18524/10 (13-36).

Turkey. Izmir. Bozdağ (a mount 2157 m high; 38°20'N-28°05'E), 1200 m a.s.l. Leg. K. Olgun, 22.VI.1997. 14 spec.: 7 ♂♂ MZUF 26217 (ex 5134 NHCL, in exchange from the KOC) (13-35), MZUF 26218 (ex 5135 NHCL, in exchange from the KOC) (13-32), 5 unnumbered spec. KOC (13-37, 13-38, 14-37, 14-?, 13-36); 7 ♀♀ MUF 26219 (ex 5136 NHCL, in exchange from the KOC) (13-37), MZUF 26220 (ex 5137 NHCL, in exchange from the KOC) (13-35), 5 unnumbered spec. KOC (13-36, 13-37, 13-39, 13-38, 14-34).

Turkey. Niksar (40°35'N-36°57'E), 35 km NE of Tokat, 1200 m a.s.l. Leg. K. Olgun, 19.V.1990. 14 spec.: 7 ♂♂ MZUF 26221 (ex 5138 NHCL, in exchange from the KOC) (13-44), MZUF 26222 (ex 5139 NHCL, in exchange from the KOC) (13-38), 5 unnumbered spec. KOC (13-36, 13-34, 13-33, 13-34, 13-33); 7 ♀♀ MZUF 26223 (ex 5140 NHCL, in exchange from the KOC) (13-35), MZUF 26224 (ex 5141 NHCL, in exchange from the KOC) (13-36), 5 unnumbered spec. KOC (13-30, 13-36, 13-33, 13-?, 13-?).

Data from the literature. Herre (1933): 13 trv. in 1 spec. Teege (1967): 12 trv. in 1 spec. Arntzen & Wallis (1994): in 19 spec., 1 spec. with 12 trv., 14 with 13 and 4 with 14. Arntzen & Olgun (2000): in 137 spec., 4 spec. with 12 trv., 99 with 13 and 34 with 14 [all the Arntzen & Olgun's data of Table 2, excluding those of *Triturus montandoni* (supplied by Lanza), have been modified because the sacral vertebra was included in their paper].

Our data:

trv.	spec.	range	m ± s	cl 5%
♂♂	28	13-14	13.1 ± 0.315	12.98-13.23
♀♀	26	13-14	13.2 ± 0.368	13.01-13.3
uns.	26	13-14	13.1 ± 0.272	12.97-13.19
♂♂+♀♀+uns.	80	13-14	13.1 ± 0.318	13.04-13.18
pov.	spec.	range	m ± s	cl 5%
♂♂	25	32-44	37.3 ± 3.288	35.96-38.68
♀♀	22	30-40	35.6 ± 2.25	34.63-36.64
♂♂+♀♀+uns.	47	30-44	36.5 ± 2.948	35.69-37.37

Triturus vittatus cilicensis (Wolterstorff, 1906) (20 spec.: 10 ♂♂, 10 ♀♀).

Turkey. Adana, 37°01'N-35°18'E. Leg. M. Başoğlu; III.1952; 2 spec.: 1 ♂ MZUF 25543 (ex 4766 NHCL) (12-37); 1 ♀ MZUF 25544 (ex 4767 NHCL) (12-32).

Turkey. Mersin (= İçel), 36°48'N-34°38'E. Mezitli. Leg. M. Başoğlu; 22.I.1968; 2 spec.: 1 ♂ MZUF 25545 (ex 4768 NHCL) (12-36); 1 ♀ MZUF 25546 (ex 4769 NHCL) (12-34).

Turkey. Mersin (= İçel), 36°48'N-34°38'E. Leg. İ. Baran; 1968; 2 spec.: 1 ♂ MZUF 5036 (12-40); 1 ♀ MZUF 5037 (13-37).

Turkey. Mersin (= İçel), 36°48'N-34°38'E. 5 km NW of Mersin, 30 m a.s.l. Leg. K. Olgun; 21.III.1995. 14 spec.: 7 ♂♂ MZUF 26213 (ex 5130 NHCL, in exchange from the KOC) (12-36), MZUF 26214 (ex 5131 NHCL, in exchange from the KOC) (12-39), 5 unnumbered spec. KOC (12-36, 12-37, 12-37, 12-37, 12-39); 7 ♀♀ MZUF 26215 (ex 5132 NHCL, in exchange from the KOC) (12-34), MZUF 26216 (ex 5133 NHCL, in exchange from the KOC) (12-31), 5 unnumbered spec. KOC (12-33, 12-34, 12-33, 12-35, 13-30).

Data from the literature. Arntzen & Olgun (2000): in 7 spec., 2 spec. with 11 trv, 5 with 12 [all the Arntzen & Olgun's data of Table 2, excluding those of *Triturus montandoni* (supplied by Lanza), have been modified because the sacral vertebra was included in their paper].

Our data:

trv.	spec.	range	m ± s	cl 5%
♂♂	10	12	12	-
♀♀	10	12-13	12.2 ± 0.422	11.90-12.50
♂♂+♀♀	20	12-13	12.1 ± 0.308	11.96-12.24
pov.	spec.	range	m ± s	cl 5%
♂♂	10	36-40	37.4 ± 1.43	36.38-38.42
♀♀	10	30-37	33.3 ± 2.003	31.87-34.73

Postsacral vertebrae: statistically significant difference between ♂♂ and ♀♀ [G-test (Williams' correction) = 19.539; df 1; P < 0.001]

Triturus vittatus ophryticus (Berthold, 1846) (80 spec.: 17 ♂♂, 15 ♀♀, 48 uns.)

Western populations : (47 spec.: 2 ♂♂, 1 ♀, 44 uns.)

Turkey. Bursa, 40°11'N-29°04'E. Leg. ? Date ? 1 spec.: 1 uns. ZFMK 2054 (11-?).

Turkey. Sapanca Lake, 40°41'N-30°16'E. Leg. ? Date ? 4 spec.: 4 uns. ZFMK 35549-35552 (all with 12 trv.).

Turkey. Adapazari, 40°46'N-30°24'E. Leg. J. W. Arntzen; 7.IV.1983; 17 spec.: 17 uns. ZMA 7562/1-17. Leg. J. W. Arntzen, 8.IV.1983; 6 spec.: 6 uns. ZMA 7558/1-6. Leg. J. W. Arntzen, 8.V.1986; 2 spec.: 2 uns. ZMA 7851/1-2. Leg. ? Date ? 5 spec.: 5 unnumbered uns. ZMA (altogether 17 spec. with 12 trv., 13 with 13).

Turkey. Abant Lake, near Bolu (Bolu, 44°44'N-31°37'E). Leg. ? Date ? 8 spec.: 8 uns. ZFMK 8294, 19183, 37412-37417 (6 spec. with 12 trv., 2 with 13). Leg. J. F. Schmidtler & J. J. Schmidtler; 14.IV.1966; 3 spec.: 2 ♂♂ MZUF 22575 (ex 3939 NHCL) (12-?), MZUF 22576 (ex 3940 NHCL) (12-?); 1 ♀ MZUF 22577 (ex 3941 NHCL) (12-?).

Turkey. Stream W of Zonguldak (Zonguldak, 41°27'N-31°49'E). Leg. Croockewit & Maas Geeteranus; 3.VI.1951; 1 spec.: 1 uns. ZMA 5033 (12-?).

Eastern populations (33 spec.: 15 ♂♂, 14 ♀♀, 4 uns.)

Turkey. Tokat. Erbaa (40°40'N-36°34'E). 20 km N of Erbaa, 1400 m a.s.l. Leg.

K. Olgun, 15.V.1991. 14 spec.: 7 ♂♂ MZUF 26205 (ex 5122 NHCL, in exchange from the KOC) (13-39), MZUF 26206 (ex 5123 NHCL, in exchange from the KOC) (13-44), 5 unnumbered spec. KOC (13-42, 13-41, 13-46, 13-40, 13-43); 7 ♀♀ MZUF 26207 (ex 5124 NHCL, in exchange from the KOC) (13-40), MZUF 26208 (ex 5125 NHCL, in exchange from the KOC) (14-41), 5 unnumbered spec. KOC (13-37, 13-38, 13-34, 13-40, 13-35).

Turkey. Ordu. Ulubey (40°48'N-37°44'E). 20 km S of Ulubey, 1100 m a.s.l. Leg. K. Olgun, 20.V.1991. 14 spec.: 7 ♂♂ MZUF 26209 (ex 5126 NHCL, in exchange from the KOC) (13-42), MZUF 26210 (ex 5127 NHCL, in exchange from the KOC) (13-?), 5 unnumbered spec. KOC (13-37, 13-44, 13-40, 13-?, 13-42); 7 ♀♀ MZUF 26211 (ex 5128 NHCL, in exchange from the KOC) (13-40), MZUF 26212 (ex 5129 NHCL, in exchange from the KOC) (13-?), 5 unnumbered spec. KOC (13-40, 13-?, 13-38, 13-40, 13-38).

Turkey. Trabzon Prov. Beşikdüzü, 41°30'N-39°13'E, ca 90 m a.s.l. Leg. H. Çetin; 11.III.1974; 1 spec.: 1 ♂ MZUF 25542 (ex 4765 NHCL) (12-42).

Georgia. Riza Lake. Leg.? Date? 4 spec.: 4 uns. 14129, 14131, 37418, 37419 ZFMK (3 spec. with 13 trv., 1 with 12; ? pov.).

Data from the literature. According to Arntzen & Olgun (2000), in *T. vittatus ophryticus* the modal count of the trunk vertebrae clinally increases from W (modal value 12) to E (modal value 13); therefore we separately analysed the counts of the populations living between latitudes 29°04'E and 31°49'E and latitudes 36°34'E and 39°13'E [all the Arntzen & Olgun's data of Table 2, excluding those of *Triturus montandoni* (supplied by Lanza), have been modified because the sacral vertebra was included in their paper].

Our data (see also above «Data from the literature»). No data on the pov.

Western populations

trv.	n	range	m±s	cl 5%
♂♂	2	12	12	-
♀♀	1	12	-	-
uns.	44	11-13	12.3 ± 0.518	12.17-12.47
♂♂+♀♀+uns.	47	11-13	12.3 ± 0.507	12.15-12.44

Eastern populations

trv.	n	range	m±s	cl 5%
♂♂	15	12-13	12.93 ± 0.258	12.79-13.08
♀♀	14	13-14	13.1 ± 0.267	12.92-13.23
uns.	4	12-13	12.8 ± 0.5	11.95-13.55
♂♂+♀♀+uns.	33	12-14	13 ± 0.305	12.87-13.07
pov.	n	range	m±s	cl 5%
♂♂	13	37-46	41.7 ± 2.359	40.27-43.12
♀♀	12	34-41	38.4 ± 2.193	37.02-39.81

Postsacral vertebrae: statistically significant difference between ♂♂ and ♀♀ [G-test (Williams correction) = 10.079; df = 1; 0.001 < P < 0.01]

Triturus vittatus vittatus (Jenyns, 1835) (18 spec.: 8 ♂♂, 10 ♀♀).

Turkey. Gaziantep, 37°05'N-37°22'E. 15 km N of Sakçagözü. Leg. J. F. Schmidtler & J. J. Schmidtler; 26.IV.1967; 2 spec.: 2 ♀♀ MZUF 22578 (ex 3942 NHCL) (12-?), MZUF 22579 (ex 3943 NHCL) (12-reg.).

Turkey. İstâhiye, 37°03'N-36°36'E. Leg. H. Zenbilcioğlu; 29.III.1975; 2 spec.: 1 ♂ 25538 MZUF (ex 4761 NHCL) (12-35); 1 ♀ MZUF 25539 (ex 4762) (12-32).

Turkey. Antakya. Hatay (36°12'N-36°10'E). 13 km N of Hatay, 100 m a.s.l. Leg. K. Olgun, 21.III.1995. 14 spec.: 7 ♂♂ MZUF 26201 (ex 5118 NHCL, in exchange from the KOC) (12-40), MZUF 26202 (ex 5119 NHCL, in exchange from the KOC) (12-?), 5 unnumbered KOC (12-36, 12-34, 12-?, 12-33, 12-31); 7 ♀♀ MZUF 26203 (ex 5120 NHCL, in exchange from the KOC) (12-32), MZUF 26204 (ex 5121 NHCL, in exchange from the KOC) (12-32), 5 unnumbered KOC (12-34, 12-32, 12-33, 12-29, 12-30).

Data from the literature. Arntzen & Olgun (2000): 16 spec. all with 12 trv. [all the Arntzen & Olgun's data of Table 2, excluding those of *Triturus montandoni* (supplied by Lanza), have been modified because the sacral vertebra was included in their paper].

Our data:

trv.	spec.	range	m ± s	cl 5%
♂♂	8	12	12	-
♀♀	10	12	12	-
pov.	spec.	range	m ± s	cl 5%
♂♂	6	31-40	34.83 ± 3.061	31.62-38.05
♀♀	8	29-34	31.75 ± 1.0581	30.43-33.07
♂♂+♀♀	14	29-40	33.1 ± 2.731	31.5-34.65

Postsacral vertebrae: statistically significant difference between ♂♂ and ♀♀ uncertain.

Triturus vulgaris kosswigi Freytag, 1955 (48 spec.: 21 ♂♂, 27 ♀♀).

Turkey. Bolu, 40°44'N-31°37'E. Emissary of Abant Lake, near Bolu, 1300 m a.s.l. Leg. J. Eiselt *et al.* (III. Anatolien Exp.); 7.IV.1966; 9 spec.: 5 ♂♂ NMW 18528/7 (12-34), 18528/8 (12-34), 18528/9 (11-34), 18528/10 (12-32), 18528/12 (12-29) NMW; 4 ♀♀ 18528/13 (12-29), 18528/15 (12-31), 18528/17 (12-29) and MZUF 22590 (ex 919 NHCL, formerly 18528/14 NMW) (12-31).

Turkey. Düzce, 40°50'N-31°10'E, 130 m a.s.l. Leg. J. Eiselt *et al.* (III. Anatolien Exp.); 7.IV.1966; 6 spec.: 5 ♂♂ NMW 18528/1 (12-30), 18528/2 (12-31), 18528/3 (12-32), 18528/4 (12-31) and MZUF 22589 (ex 918 NHCL, formerly 18528/5 NMW) (12-34); 1 ♀ NMW 18528/6 (12-28).

Turkey. Adapazarı, 40°46'N-30°24'E. Leg. J. W. Arntzen; 29.V.1978; 16 spec.

ZMA (7305/1-3) and 8.IV.1983 (7555/1-13): 16 spec.: 3 ♂♂ 7305/2 (12-32), 7305/3 (12-31), 7555/1 (12-33) ZMA; 13 ♀♀ 7305/1 (12-30), 7555/2 (12-29), 7555/3 (12-31), 7555/4 (12-29), 7555/5 (12-32), 7555/6 (12-28), 7555/7 (12-28), 7555/8 (12-30), 7555/9 (13-31), 7555/10 (12-28), 7555/11 (12-29), 7555/12 (12-31), 7555/13 (12-29).

Turkey. Adapazarı, 40°46'N-30°24'E. 10 km SW of Adapazarı, 31 m a.s.l. Leg. K. Olgun, N. Taskın, A. Avcı & B. Özdemir; 22.IV.2002; 17 spec.: 8 ♂♂ 26158 MZUF (ex 5101 NHCL, formerly No. 2 KOC) (12-?), KOC Nos 4, 5, 7-10, 15 (all with 12-?); 9 ♀♀ MZUF 26159 (ex 5102 NHCL, formerly No. 7 KOC) (12-?), KOC Nos. 2, 3, 5, 6, 8, 10, 11, 12 (all with 12-?).

Data from the literature: seemingly no data.

Our data:

trv.	spec.	range	m ± s	cl 5%
♂♂	21	11-12	11.95 ± 0.218	11.85-12.05
♀♀	27	12-13	12.03 ± 0.192	11.96-12.11
♂♂+♀♀+uns.	48	11-13	12 ± 0.206	11.94-12.06
pov.	spec.	range	m ± s	cl 5%
♂♂	13	29-34	32.1 ± 1.656	31.08-33.08
♀♀	18	28-32	29.6 ± 1.29	28.97-30.25

Postsacral vertebrae: statistically significant difference between ♂♂ and ♀♀ [G-test (Williams correction) = 14.599; df = 6; 0.02 < P < 0.05]

Triturus vulgaris schmidtlerorum Raxworthy, 1988 (23 spec.: 11 ♂♂, 12 ♀♀).

Considered a synonym of *T. vulgaris vulgaris* by Başoğlu *et al.* (1996), Olgun *et al.* (1999) and Lanza *et al.* (2005).

Turkey. Lâpseki, 40°21'N-26°41'E. 3 km E of Lâpseki, 20 m a. s. l. Leg. K. Olgun; 4.IV.1997. 20 spec.: 10 ♂♂: 1 ♂ MZUF 26162 (ex 5105 NHCL, formerly collective No. 140/1997 ZDEU) (12-?), 9 ♂♂ ZDEU collective No. 140/1997 (all with 12-?); 10 ♀♀: 1 ♀ MZUF 26163 (ex 5106 NHCL) (12-?), 9 ♀♀ ZDEU collective No. 140/1997 (all with 12-?).

Turkey. Karacabey, 40°12'N-28°22'E. 3 km S of Karacabey, 50 m a. s. l. Leg. J. F. Schmidtler & J. J. Schmidtler; 12.IV.1966; 1 spec.: ♀ MZUF 22591 (ex 3956 NHCL) (12-?).

Turkey. İzmir (= Bornova), 38°27'N-27°14'E. Leg. İ. Baran; 1968; 2 spec.: 1 ♂ MZUF 5034 (?-37); 1 ♀ MZUF 5035 (12-29).

Data from the literature: seemingly no data.

Our data:

trv.	spec.	range	m ± s	cl 5%
♂♂	10	12	12	-
♀♀	10	12	12	-
pov.	spec.	range	m ± s	cl 5%
♂♂	1	37	-	-
♀♀	1	29	-	-
♂♂+♀♀	2	29-37	33	-

Triturus vulgaris vulgaris (Linnaeus, 1758) (20 spec.: 10 ♂♂, 10 ♀♀).

Turkey. Bolayır (40°31'N-26°45'E); 5 km NE of Bolayır, 30 m a.s.l. 20 ♂♂: 1 ♂ MZUF 26160 (ex 5103 NHCL, formerly collective No. 143/1997 KOC) (13-?), 9 ♂♂ collective No. 143/1997 KOC (all 12-?); 10 ♀♀: 1 ♀ MZUF 26161 (ex 5104 NHCL, formerly collective No. 143/1997 KOC (12-?), 9 ♀♀ collective No. 143/1997 KOC; leg. K. Olgun, 3.IV.1997; formerly 143/1997 KOC (all 12-?).

Data from the literature. Pellarini and Lapini (1996) and Lapini *et al.* (1999): 12 (23.5%)-13 (76.5%) trv. in 17 spec. from Julian Alps, W of the Isonzo River.

Our data:

trv.	spec.	range	m ± s	cl 5%
♂♂	10	12-13	12.1 ± 0.316	11.87-12.33
♀♀	10	12	12	12
♂♂+♀♀	20	12-13	12.05 ± 0.224	11.95-12.15

Triturus vulgaris subsp. (19 spec.: 10 ♂♂, 9 ♀♀).

Turkey. Archaeological site of Efes (= Ephesus, 37°55'N-27°19'E), 30 m a.s.l. Leg. N. Taşkın, K. Olgun & A. Avcı; 1997, 2.II. 2000 and 2.IV.2000. 19 spec.: 10 ♂♂ MZUF 26164 (ex 5107 NHCL, formerly No. 4 KOC) (12-?), KOC Nos 5, 7, 9, 10, 11, 15, 18, 20, 21 (all with 12-?); 9 ♀♀ MZUF 26165 (ex 5108 NHCL, formerly 6 KOC) (12-?), KOC Nos 1, 3, 5, 7, 9-11, 17 (8 spec. with 12 trv, 1 with 13; KOC No. 8, with anomalous vertebral column, excluded).

Data from the literature: no data.

Our data:

trv.	spec.	range	m ± s	cl 5%
♂♂	10	12	12	-
♀♀	9	12-13	12.11 ± 0.333	11.85-12.37
♂♂+♀♀	19	12-13	12.1 ± 0.229	11.94-12.16

Conclusions

The vertebral count data for the genera *Batrachuperus* and *Neurergus* are seem-

ingly the first to appear in the literature. *Batrachuperus persicus* has 16 or, usually, 17 trunk vertebrae and 41-44 postsacral ones. In the genus *Neurergus*, the trunk vertebrae usually number 13, sometimes 14, and the postsacral ones 32-39.

The number of trunk vertebrae in the three subspecies of *Triturus vittatus* basically correspond to those already known (cf. Arntzen & Olgun, 2000). The trunk and postsacral vertebrae are respectively 12 and 29-40 in *T. v. vittatus*, and usually 12, sometimes 13, and 30-40 in *T. v. cilicensis*. We confirm that in *T. vittatus ophryticus* the modal count of the trunk vertebrae clinally increases from W (modal value 12) to E (modal value 13), as pointed out by Arntzen & Olgun (2000). Therefore, we separately analysed the counts of the populations respectively living between the latitudes 29°04'E and latitudes 31°49'E and 36°34'E-39°13'E (and in Georgia). The number of trunk vertebrae ranges between 11 and 13, with a modal value of 12, in the western populations, and between 12 and 14, with a modal value of 13, in the eastern ones; the difference in number of trunk vertebrae between the western and eastern populations is highly significant [G-test (Williams' correction) $P < 0.001$]. We found 34-46 postsacral vertebrae in the eastern populations (no data on the western populations).

In *Triturus vulgaris kosswigi*, *T. vulgaris schmidtlerorum* (almost surely a synonym of *T. v. vulgaris*), *T. v. vulgaris* and the "subspecies" from Ephesus, the number of trunk vertebrae ranges from 11 (only found in one specimen of *T. v. kosswigi*) to 13, with a modal value and a mean of about 12.

We did not find a significant difference in the number of trunk vertebrae between ♂♂ and ♀♀ in any of the species.

In all the species (except *Neurergus s. trauchii* and *N. s. barani*), ♂♂ had a higher average number of postsacral vertebrae than ♀♀. However, due to the small number of specimens in part of our material, the sex differences were statistically significant only in *Triturus vittatus cilicensis*, *T. vittatus ophryticus* and *T. vulgaris kosswigi*.

Acknowledgments

We wish to thank Annamaria Nistri for her technical help, J. W. Arntzen and D. B. Wake for unpublished information.

References

- Arntzen, J.W. & Olgun, K., 2000 - Taxonomy of the banded newt, *Triturus vittatus*: morphological and allozyme data. *Amphibia-Reptilia*, 21: 155-168.
- Arntzen, J.W. & Wallis G.P., 1994 - The «Wolterstorff Index» and its value to the taxonomy of the Crested Newt superspecies. *Abhandlungen und Berichte für Naturkunde und Vorgeschichte*, Magdeburg, 17: 57-66.
- Başoğlu M., Özeti N. & Yılmaz I., 1996 - The amphibians of Turkey. *Ege Univ. Fen. Fak., Kitaplar Serisi*, Izmir, 151: 1-221.
- Herre W., 1933 - Vergleichende Untersuchungen an den Unterarten des *Triturus cristatus* Laur. *Zeitschrift für Anatomie und Entwicklungsgeschichte*, Berlin, 99: 1-62.

- Lanza, B., Arntzen, J. W. & Gentile E. (in progress) - Vertebral number in the Caudata of the western Palaearctic.
- Lanza B., Catelani T. & Lotti S., 2005 - Amphibia Caudata and Gymnophiona donated by Benedetto Lanza to the Museo di Storia Naturale, University of Florence. Catalogue with morphological, biological, biogeographical and taxonomic data. *Atti del Museo Civico di Storia Naturale di Trieste*, Trieste, 51 [2004]: 177-266.
- Lapini L., dall'Asta A., Bressi N., Dolce S. & Pellarini P., 1999 - Atlante corologico degli Anfibi e dei Rettili del Friuli-Venezia Giulia. (Pubblicazione n. 43). *Edizioni del Museo Friulano di Storia Naturale, Comune di Udine, Udine*.
- Olgun K., Baran İ. & Tok C. V., 1999 - The taxonomic status of *Triturus vulgaris* (Linnaeus, 1758) populations in western Anatolia, Turkey. *Turkish Journal of Zoology*, 23: 133-140.
- Pellarini P. & Lapini L., 2000 [not Papini L.!] - Differenze etologiche e morfologiche tra *Triturus vulgaris vulgaris* (Linnaeus, 1758) e *Triturus vulgaris meridionalis*. In: Atti, I Congresso Nazionale della *Societas Herpetologica Italica*, Giacomina C. (ed.), (Torino, 2-6 ottobre 1996). *Museo Regionale di Scienze Naturali*; Torino: 347-351.
- Teege M.-J., 1957- Studien zur Entwicklung und Gestalt der Urodelenwirbel. *Zeitschrift für wissenschaftliche Zoologie (Abteilung A)*, Leipzig, 160 [1957-1958]: 95-163.

Ricevuto: 23 giugno 2005

Approvato: 6 settembre 2005